The Effect of Poor Investment Experiences and Personality on Risk Aversion

Research Proposal

Finance and Economics in the Fisher College of Business at The Ohio State University

By

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Undergraduate Program in Honors Contract

The Ohio State University

2019

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Abstract

This study analyzed the relationship between certain personality traits, as measured by the Big Five Inventory Assessment (Donellan, et al. 2006) and their Constant Absolute Risk Aversion score (Pratt 1964)(Arrow 1965) moderated on the variable of whether one has experienced a negative investment return. The experiment was conducted on 293 respondents from Amazon's Mechanical Turk platform. Respondents were first given a 20-question version of the Big Five Inventory assessment to measure the degree to which they exhibited the five personality traits. Then, respondents would be told that they were entering a lottery that would determine whether their survey compensation would shrink, with half of respondents being told that they would lose the lottery, and therefore, would experience a simulated negative return. Afterwards, respondents were presented with up to 17 decisions, each consisting of a fixed winning, which would increase in every choice, or a 50-50 lottery with $100 and $0 as the possibilities. Risk aversion was measured based on when respondents first chose the fixed amount. The results showed that the only statistically significant interaction was the moderating effect of the simulated negative investment return on the relationship between the personality trait Openness and risk aversion. However, given the insignificant isolated effect of the treatment, it is likely that the loss involved was not large enough to simulate an actual investment return. Additional research will go farther in reaching a deterministic conclusion as to the associations to be found from this experiment.

Acknowledgements

I would like to thank Dr. Paul Healy, my faculty advisor and Dr. Roger Bailey, the director of the Honors Immersion Program, for their support and guidance throughout the course of the project. I would also like to thank the Fisher College of Business and the Honors and Scholars Center for furnishing the Research Scholarship that funded the project, and, as a result, made it possible.

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I. Introduction

The field of Behavioral Finance challenges the assumption from traditional economic theory that people act rationally. Those who study Behavioral Finance have theorized that people often do not make their economic decisions rationally. One component of this phenomenon is the bias inherent in people's economic decisions. They have further stated that this bias is predictable, can be measured, and can be affected by a myriad of factors. This research will focus on the effects of individuals' personalities and their investment histories, namely, when they lose money on an investment. Given that the Financial Crisis of 2008 occurred merely 10 years ago, for many, the effects of the ensuing stock market crash still remain fresh in their minds. The value of many people's portfolios cratered, and millions lost their jobs, and even their houses during that time. Many individuals' investments generated abysmal returns during that time period. A Gallup study published in *The Chicago* Tribune showed that 62% of Americans owned stocks in 2008, while only 54% currently own them, suggesting that the negative experience caused people to become more risk averse. Not only will this research seek to evaluate the possibility of this phenomenon, but it will also analyze how these negative experiences can interfere with the traditional effects of one's personality on their investment habits.

II. Relevant Literature

a. Big Five Inventory Assessment – Relevant Literature

Measuring personality is nothing new. Countless personality tests have been developed to put a metric on their personal personas. The Big Five Inventory was first developed by Ernest Tupes and Raymond Christal in 1961, and was advanced by Lewis Goldberg in 1961. Goldberg's "An Alternative 'Description of Personality': The Big-Five Factor Structure" (1990) showcased the development of the five-factor metric. This involved grouping hundreds of common descriptive terms into clusters, these clusters being overarching personality descriptors. Throughout 3 studies, there were 5 clusters that remained constant, despite being tested across multiple analytical methodologies and different choices of common descriptive terms. These 5 clusters became the five main factors that would be applied throughout countless future studies. This study is the baseline for how the personality traits in this research are defined. Figure 1 gives a description of the five personality traits that make up the Big Five.

Figure 1

Description of the Five IPIP-BFM-50 Scales (Strus et al., 2014b)

Scale	Object of measurement	Individuals who score high may be described as:	Individuals who score low may be described as:
Extraversion	The level of activity, energy, as well as sociability and social confidence (assertiveness).	active, energetic, extraverted, talkative, bold, and assertive.	introverted, reserved, quiet, and socially inhibited.
Agreeableness	Positive (vs. negative) attitude towards people.	trustful, kind, considerate and warm as well as cooperative and helpful.	distrustful, selfish, unkind, rude, and emotionally cold towards other people.
Conscientiousness	The level of organization, diligence in pursuing goals and performing tasks as well as proneness to order and dutifulness.	organized, diligent, thorough and efficient in what they do as well as systematic and dutiful.	unsystematic and inconsistent, unconcerned with order and planning, negligent, careless, and undependable.
Emotional Stability	The level of reactivity and emotional stability, emotional resistance and tolerance to frustration.	imperturbable, calm, relaxed, not prone to negative emotional states.	anxious, nervous, moody, prone to worry and oversensitive as well as envious, touchy, prone to anger and irritation.
Intellect	Intellectual openness, creativity, and imagination.	intellectually active and cognitively open, creative, introspective, having a vivid imagination and a wide range of interests.	unintellectual, noninquisitive, unimaginative, simple, unsophisticated, unreflective and uncreative.

The first personality tests to apply this new metric were the BFI-44 test published in "The Big Five Inventory – Versions 4a and 54" by Oliver P. John, R.W. Robins, and L.A. Pervin in 1991, and Lewis Goldberg's own BFI-50 version published in "The Development of Markers for the Big-Five Factor Structure" (1992). The tests both applied the metric by assigning scores to respondents for each of the five personality traits. The BFI-44 (John, et al.) consisted of 44 items that would be considered in calculating the scores, while the BFI-50 (Goldberg) consisted of 50 questions. In both tests, respondents would answer the questions on a self-report basis on a five-point scale for how much they agreed with statements about themselves. They have each

been described as a complex image of one's personality that can be generated in merely 5 minutes. These tests were the first true applications of factor analysis, the method commonly known today as the best way to 'summarize' an individual.

Years later, a new version known as the Mini-IPIP was published in "The Mini-IPIP Scales: Tiny-yet-Effective Measures of the Big Five factors of Personality" by M.B. Donnellan, F.L. Oswald, B.M. Baird, and R.E. Lucas in 2006. The Mini-IPIP was created as an abridged version of Goldberg's 50 item model, that still retained most of its accuracy. The questions were validated by checking for its consistency across studies, with each question having a consistency of greater than 0.6. It has been recognized as an acceptable measure of the Big Five factors that can be taken in even less time than the original version. This provides the backbone for personality assessment portion of my survey. Since the survey consists of the personality test and the risk experiment, finding a way to get an accurate measure of one's personality in as little time as possible is crucial, and helps to prevent respondents from experiencing fatigue while taking the survey.

As mentioned before, the relationship between risk averseness and personality has been well documented. "Personality and Domain-Specific Risk Taking" by Nigel Nicholson, Emma Soane, Mark Fenton-O'Creevy, and Paul Willman (2005) examines the relationship between Big-Five factors and risk habits in various contexts, including personal health, career, and personal finance. The study then assigned an overall risk-taking measure, to account for the respondents' general risk habits. The study found significant associations between overall risk aversion and the traits of Neuroticism, Agreeableness, and Conscientiousness. They found significant associations between risk-loving and the traits of Extraversion and Openness. One

thing to note is that it does not focus on one particular area. Another distinction between this study and the one I have planned is that the risk data is obtained through subjective self-reporting through a five-point scale, rather than through a choice between a risky option and a less risky option. This could invite some bias from respondents, and it would be interesting to see how the results differ between the two methods.

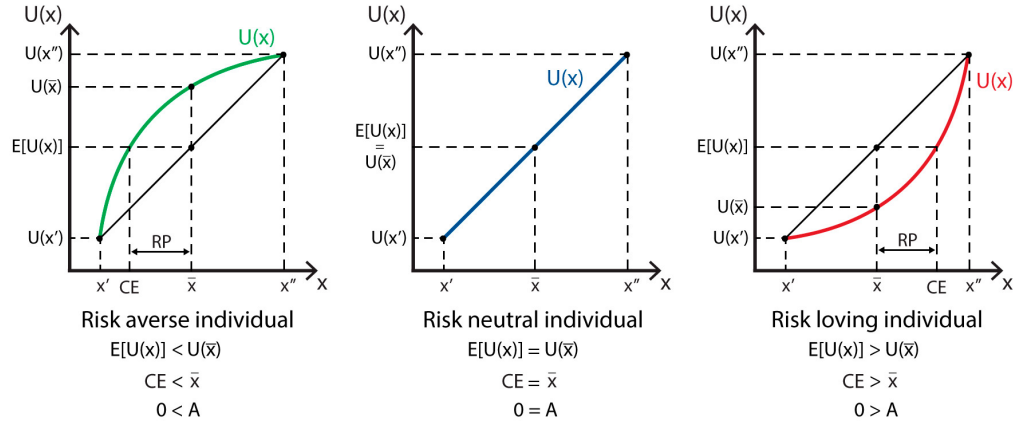
b. Risk Aversion – Relevant Literature

The basis for the Arrow-Pratt measure, which this research is based on, was developed by Daniel Bernoulli in 1738 in his paper "Commentarii Academiae Scientiarum Imperialis Petropolitanae", where he published the solution to the notorious St. Petersburg Paradox as a concept known as Expected Utility. It stipulated that the way people say value in things is not in an objective way. Rather, they have a subjective valuation of different outcomes. In order to grasp Expected Utility, one must multiply the utility one receives from each outcome in an uncertain situation by the probability of that outcome happening. This is especially relevant to a lottery. It was not until 1944, however, when the concept became truly a robust mathematical theory. This was due to the work of John von Neumann and Oskar Morgenstern in their book Theory of Games and Economic Behavior. In this book, Expected Utility was defined as $EU(L) = U(c_1)*p_1 + U(c_2)*p_2 + \ldots + U(c_n)*p_n$ with L being a lottery, c_i being possible outcomes, and p_i being the probability of the outcome occurring. Since utility was considered a subjective measure, the utility that one places on one outcome might be different than someone else. It also introduced the concept of the Certainty Equivalent, a certain amount in which people

would place the same utility as the expected utility of an uncertain event. Conceivably, this Certainty Equivalent would change based on the person in the situation, since utility is subjective. Therefore, one can glean from this certainty equivalent of individuals their level of risk averseness. This concept would pave the way for the measure which this research is based on.

The measure of risk averseness came with the publishing of two papers: John W. Pratt's "Risk Aversion in the Small and in the Large" (1964) and Kenneth Arrow's "The Theory of Risk Aversion" (1965). Both papers were based off of the idea that risk aversion could be measured by looking at individual's certainty equivalents, where, when faced with a choice between a certain amount and an uncertain lottery, the individual places the same utility on both (their indifference point). Since utility is a subjective measure, one's certainty equivalent might not be where it equals the expected amount of the lottery. Arrow and Pratt theorized that the farther one's certainty equivalent is away from the expected value of the lottery, the greater premium they place on that certainty, and therefore, the more risk averse they are. Their metric is based off of one's subjective utility function, which can be fitted to the situation. Their measure, the Constant Absolute Risk Aversion (CARA) is calculated by dividing the second derivative of the utility function by the first derivative multiplied by -1. Since having a lower certainty equivalent would result in the curve being more convex, Arrow and Pratt also theorized that the more convex the utility curve is, the more risk averse the person is. Figure 1 visualizes this theory. This metric proves to be a perfect fit for the planned study, since the idea of the uncertain outcome can be applied to investing.

Figure 2



http://policonomics.com/wp-content/uploads/2016/02/Risk-aversion.jpg

In order to conduct the most precise experiment, this research will consider other factors that affect risk aversion to control for. One well-known factor that influences risk-aversion is gender, with males being significantly less risk-averse than females (Powell and Ansic 1997). Another factor to consider is Age, with older individuals generally more risk-averse than younger individuals (Jianakoplos and Bernasek 2006). These, in addition to wealth and education status are controlled for in the experiment.

Another application of the Big-Five factors to risk averseness comes with "Measuring Risk Attitudes in the lab: Task or Ask? An Empirical Comparison" by J. Lonnqvist, M. Verkasalo, G. Walkowitz, and P.C. Wichardt (2015). This study considers a lottery selection experiment as a way to measure risk aversion. However, the lottery task is only one of three parts of this experiment, with a trust-based activity preceding the lottery task. The lottery task is also slightly different than the traditional Arrow-Pratt experiments, with the choices being between two uncertain lotteries rather than between a certain amount and one uncertain lottery. It remains to be seen whether this structure has an effect on the results of the study. While the

study did not find any significant links between the Big-Five factors and the results of the lottery task, the authors of the paper admit that the placement of the task after the trust activity could have possibly biased the results of the lottery task. The study I conducted does not have any decision-based tasks before the lottery task. Therefore, my research may answer whether the placement of the task matters.

c. Negative Economic Experiences and Risk Aversion – Relevant Literature

The connection between economic experiences and risk aversion is much less documented than the link between personality traits and risk aversion. The most relevant article to this topic showcases the link between macroeconomic events and risk aversion. "Depression Babies: Do Macroeconomic Experiences Affect Risk Taking?" by U. Malmendier and Stefan Nagel (2007) examined the link between living through periods of slow stock-market growth and risk aversion. The study did conclude that living through these periods had a significant relationship with risk aversion. However, it remains to be seen whether these effects stay the same when considering personal economic events.

III. Methodology

a. Explanation of Survey

In order to collect the data needed for this study, a survey was administered that sorted respondents into two groups: those without a negative experience in investing, and those with one. There were six scores to calculate: The score for each of the five personality traits in the Big Five Inventory Assessment, and the Arrow Pratt Score of Absolute Risk Aversion. This survey was administered through Amazon's Mechanical Turk (mTurk) surveying software. Including a disproportionate number of individuals from college could bias the results, since it has been proven that Age affects risk-aversion (Jianakoplos and Bernasek 2006). In addition, including a disproportionate number of people from one major or career path could also bias the results, since certain personality traits do tend to be overrepresented in particular professions compared to the population as a whole.

The first thing the survey gleans from respondents is their personality. Respondents took a 20-item version of the Big Five Inventory Assessment (Donellan et al. 2006). Each question is used to calculate the score of one of the five personality types, with each personality trait being measured across 4 questions. Each question will ask the respondent how much they agree with a statement about themselves on a five-point scale. Each of these possible responses has a point-value attached to it, ranging from 0 to 4. Figure 3 lays out the point values assigned to the answers of each of the 20 questions in the personality test

Figure 3

Point Values Assigned to each Question						
Personality Factor	Question Number	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Extraversion	1	0	1	2	3	4
	6	4	3	2	1	0
	11	0	1	2	3	4
	16	4	3	2	1	0
Agreeableness	2	0	1	2	3	4
	7	4	3	2	1	0
	12	0	1	2	3	4
	17	4	3	2	1	0
Conscientiousness	3	0	1	2	3	4
	8	4	3	2	1	0
	13	0	1	2	3	4
	18	4	3	2	1	0
Neuroticism	4	0	1	2	3	4
	9	4	3	2	1	0
	14	0	1	2	3	4
	19	4	3	2	1	0
Openness	5	0	1	2	3	4
	10	4	3	2	1	0
	15	4	3	2	1	0
	20	4	3	2	1	0

The point values from the respondent's four answers to the questions pertaining to each personality type were added up, and divided by the maximum score for the type of 16 to generate a percentage score from 0% to 100% for each personality trait. This will be used to determine how much of each personality trait the respondent exhibits.

From there, respondents were divided between treatment and control groups. Each respondent would be told that their compensation would automatically be entered into a

lottery. This was used to simulate a negative experience with an investment. Half of respondents, the Control Group, 'won' the lottery, and therefore, got to keep their entire endowment. The other half, the Treatment Group, 'lost' the lottery, and therefore, lost half of their endowment. Whether a respondent will fall into the Treatment Group or the Control Group was be determined randomly. This will be done directly after the personality section so that respondents' personality scores are not biased by the outcome of the lottery.

After the automatic lottery, respondents will enter the Arrow-Pratt experiment. This consisted of up to 17 choices, all structured the same way. The respondent was presented with a choice between a certain amount (Option A), and a lottery (Option B). In each choice, the structure of the lottery was the same: respondents would have a 50% chance of winning $100, and a 50% chance at winning nothing. Applying Bernoulli's Expected Utility Function, and assuming a risk-neutral utility curve of U(x) = 0.1x (where the utility from a certain $10 would be 1 unit, and would be 0 units for $0), each lottery had an expected utility of 5 units. An individuals' Certainty Equivalent would be the certain amount in which that they place a utility of 5 units, thus equaling the expected utility of the lottery. Since each person's utility curve is slightly different, different individuals would place a utility of 5 units on different certain amounts. For instance, one person might 5 units of utility on a certain amount of $25, while others might place those same 5 units of utility on a certain $40. Therefore, the goal of this sequence of questions was to understand the certain amount in which each respondent places the same utility as the lottery. The certain amounts varied, starting at $0. This was a mechanism to filter out respondents who clearly were not paying enough attention to the survey to be credible subjects, since there was absolutely no economic justification to taking that certain

amount. From there, the certain amounts gradually rose each time the respondents selected the lottery (Option B). The respondents would be directed to the final section of the survey upon their first selection of a guaranteed amount, which would be stored as that respondent's Certainty Equivalent.

In order to calculate Constant Absolute Risk Aversion from these data points, each Certainty Equivalent had a utility function attached to it. The functions were fitted such that U(0) = 0, U(10) = 1 and U(Certain Amount of Indifference) = 5, the risk-neutral utility placed on lottery. Each possible utility functions in the experiment took the form of $U(x) = ax^b$, and plugging the certain amount into the corresponding function would yield a utility of 5. Figure 4 shows the fits to each of the possible certainty equivalents.

Figure 4

Utility Functions by Indifference Point		
Question	Certain Amount	Utility Function if Indifferent
21	$0.00	Strike from Dataset
22	$0.98	$U(x) = 5.0119x^{0.15}$
23	$3.13	$U(x) = 3.9811x^{0.2}$
24	$6.25	$U(x) = 3.1623x^{0.25}$
25	$9.92	$U(x) = 2.5119x^{0.3}$
26	$13.80	$U(x) = 1.9953x^{0.35}$
27	$17.81	$U(x) = 1.5849x^{0.4}$
28	$21.43	$U(x) = 1.6681x^{0.45}$
29	$25.00	$U(x) = x^{0.5}$
30	$31.50	$U(x) = 0.6310x^{0.6}$
31	$37.14	$U(x) = 0.398x^{0.7}$
32	$42.04	$U(x) = 0.251x^{0.8}$
33	$46.29	$U(x) = 0.158x^{0.9}$
34	$50.00	U(x) = 0.1x
35	$56.12	$U(x) = 0.0398x^{1.2}$
36	$63.00	$U(x) = 0.01x^{1.5}$
37	$70.71	$U(x) = 0.001x^{2}$

Assuming a risk-neutral utility curve of U(x) = 0.1x, a rational individual would place a utility of 5 on the lottery, since the expected award would be $50. The rational individual would, therefore, not take a certain amount less than $50. Any individual with a Certainty Equivalent of less than $50 would be known as 'risk averse'. The individual would demonstrate a willingness to place utility on certainty of the winnings rather than just the expected winnings. They would have a positive CARA score. Meanwhile, an individual with a Certainty Equivalent of greater than $50 would be known as 'risk affine'. They would demonstrate a willingness to put a premium on the uncertainty of the lottery. They would have a negative CARA score.

From here, Constant Absolute Risk Aversion was calculated by dividing the second derivative of the utility function U''(x) by the first derivative of the utility function U'(x) multiplied by -1. This provided the measure of risk averseness needed for the analysis. To ensure that this task carried actual stakes for the participants, all participants were notified that 3 random participants from the greater pool will receive a bonus on top of their endowment equal to the actual earnings from one randomly selected lottery choice that they make. Respondents were told that, for each respondent selected, one of their choices in the activity would be chosen randomly. Had they selected the certain amount, they would be awarded the certain amount. However, had they selected the lottery, the lottery would be simulated in order to derive their bonus.

This analysis would take the form of a Multiple Linear Regression, with inputs consisting of the treatment, the five personality scores, interactions between the treatment and each personality scores, and various control variables including age, wealth, gender, education level,

and a self-reported measure of whether the respondent had actually lost money in an investment before. Constant Absolute Risk Aversion would be the output of the regression.

b. Structure of the Survey

[The following will appear after participants have consented to taking the survey, and confirmed that they are at least 18 years of age]

First, you will be presented a 20-question personality test. In each question, you will be presented with a statement about yourself. You will be asked how much you agree with each statement on a 5-point scale (Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree) based on how well each statement describes you. You are encouraged to answer each question as truthfully as possible.

1) I am the life of the party
2) I sympathize with others' feelings
3) I get chores done right away
4) I have frequent mood-swings
5) I have a vivid imagination
6) I don't talk a lot
7) I am not really interested in others
8) I often forget to put things back in the proper place
9) I am relaxed most of the time
10) I have difficulty understanding abstract ideas
11) I talk to a lot of different people at parties
12) I feel others' emotions

13) I like order

14) I get upset easily

15) I am not interested in abstract ideas

16) I keep in the background

17) I am not interested in other people's problems

18) I make a mess of things

19) I seldom feel blue

20) I do not have a good imagination

Next, you will be entered into a lottery. This will determine whether or not your endowment of $2 will shrink

[If respondent is placed in the treatment group, they will receive the following message]

You have lost the lottery. As a result, your endowment will be cut in half (from $2.00 to $1.00)

[If respondent is placed in the control group, they will receive the following message]

You have won the lottery. As a result, you may keep the entire endowment of $2.00

Next, you will be presented with a few different hypothetical scenarios. Each scenario will be formatted as a choice between two options as such:

Option A:
$XX.XX

Option B:
50% chance of $100
50% chance of $0

Of the pool of participants for this survey, 3 randomly selected participants will receive a bonus (on top of their compensation) dependent on their choices in the following section. For each randomly selected participant, one of their choices will be randomly selected, and the participant's bonus will equal the resulting earnings of that choice.

For example, if, on the particular choice, a selected respondent chose Option A, they will receive the amount shown in Option A. If a selected respondent chose Option B on the particular choice, a simulation will be run where the respondent's chances of winnings will equal those in Option B.

21) Option A:
$0.00

Option B:
50% chance of $100
50% chance of $0

Given the choice between these two options, which would you pick?

22) Option A:
$0.98

Option B:
50% chance of $100
50% chance of $0

Given the choice between these two options, which would you pick?

23) Option A:
$3.13

Option B:
50% chance of $100
50% chance of $0

Given the choice between these two options, which would you pick?

24) Option A:
$6.25

Option B:
50% chance of $100
50% chance of $0

Given the choice between these two options, which would you pick?

25) Option A:
$9.92

Option B:
50% chance of $100
50% chance of $0

Given the choice between these two options, which would you pick?

26) Option A:
$13.80

Option B:
50% chance of $100
50% chance of $0

Given the choice between these two options, which would you pick?

27) Option A:
$17.81

Option B:
50% chance of $100
50% chance of $0

Given the choice between these two options, which would you pick?

28) Option A:
$21.43

Option B:
50% chance of $100
50% chance of $0

Given the choice between these two options, which would you pick?

29) Option A:
$25.00

Option B:
50% chance of $100
50% chance of $0

Given the choice between these two options, which would you pick?

30) Option A:
$31.50

Option B:
50% chance of $100
50% chance of $0

Given the choice between these two options, which would you pick?

31) Option A:
$37.14

Option B:
50% chance of $100
50% chance of $0

Given the choice between these two options, which would you pick?

32) Option A:
$42.04

Option B:
50% chance of $100
50% chance of $0

Given the choice between these two options, which would you pick?

33) Option A:
$46.29

Option B:
50% chance of $100
50% chance of $0

Given the choice between these two options, which would you pick?

34) Option A:
$50.00

Option B:
50% chance of $100
50% chance of $0

Given the choice between these two options, which would you pick?

35) Option A:
$56.12

Option B:
50% chance of $100
50% chance of $0

Given the choice between these two options, which would you pick?

36) Option A:
$63.00

Option B:
50% chance of $100
50% chance of $0

Given the choice between these two options, which would you pick?

37) Option A:
$70.71

Option B:
50% chance of $100
50% chance of $0

Given the choice between these two options, which would you pick?

Finally, you will be asked a few demographic questions.

38) What is your age?

39) What is your gender?

a. Male
b. Female
c. Other
d. Prefer not to say

40) What is the highest level of education you have completed?

a. Some High School
b. High School Graduate
c. Some College
d. Associates Degree
e. Bachelor's Degree
f. Master's Degree
g. Doctoral Degree / PhD

41) What is your annual (before tax) income?
   a. Less than $30,000
   b. $30,000 - $50,000
   c. $50,000 - $70,000
   d. $70,000 - $100,000
   e. $100,000 - $250,000
   f. Greater than $250,000
   g. Retired

42) Have you ever lost a significant amount of money on an investment (i.e. stock, mutual fund, bonds, etc.)?
   a. Yes
   b. No

IV. Hypothesis, Results, and Implications

a. Hypothesis

Among the variables that have not been tested previously, I anticipated that for those in the Treatment group, the relationship between the personality traits Openness and Extraversion and risk version would be more negative than among those in the control group. Therefore, I had anticipated that the interaction terms would be significantly negative. I also anticipated that for those in the Treatment group, the relationship between the personality traits Conscientiousness, Agreeableness, and Neuroticism and risk version would be more positive than among those in the control group. This would correspond to the three interaction terms being significantly positive.

b. Results

In obtaining these results, the survey was administered to 293 respondents on Amazon's Mechanical Turk Platform. Table 1 illustrates the composition of the dataset across each of the demographic variables collected.

Table 1 – Demographics of Respondents

Variable	Count of Respondents
Male	176
Female	117
Treatment	143
Control	150
High School Graduate	49
Some College	68
Associate's Degree	47
Bachelor's Degree	110
Master's Degree	17
Doctoral Degree	2
Less than $30,000	104
$30,000 - $50,000	87
$50,000 - $70,000	57
$70,000 - $100,000	23
$100,000 - $250,000	21
More than $250,000	1
Negative Investment Experience	65
No Negative Investment Experience	228

Each of the 293 respondents participated in the choice task of the survey. The first choice in which they chose the guaranteed amount was stored as the respondent's Certainty

Equivalent, where they were indifferent between the certain amount and the lottery. Table 2 illustrates the distribution of the respondents across the different indifference points possible, while Table 3 illustrates the average Certainty Equivalent among the different demographic groups.

Table 2 – Distribution of Certainty Equivalents

Certainty Equivalent	Count of Respondents
$ 0.98	48
$ 3.13	51
$ 6.25	18
$ 9.92	18
$ 13.80	23
$ 17.81	7
$ 21.43	20
$ 25.00	20
$ 31.50	6
$ 37.14	4
$ 42.04	14
$ 46.29	8
$ 50.00	38
$ 56.12	4
$ 63.00	5
$ 70.71	3

Table 3 – Average Indifference Point Across Demographic Variables

Variable	Count of Respondents
Male	176
Female	117
Treatment	143
Control	150
High School Graduate	49
Some College	68
Associate's Degree	47
Bachelor's Degree	110
Master's Degree	17
Doctoral Degree	2
Less than $30,000	104
$30,000 - $50,000	87
$50,000 - $70,000	57
$70,000 - $100,000	23
$100,000 - $250,000	21
More than $250,000	1
Negative Investment Experience	65
No Negative Investment Experience	228

After collecting the data, multiple different linear regressions were run on the data in order to find a model of best fit. The eventual model that yielded the highest R^2 value, indicating the model of best fit, excluded each of the income and education demographics. The same variables were significant across each model. Table 4 shows the regression results.

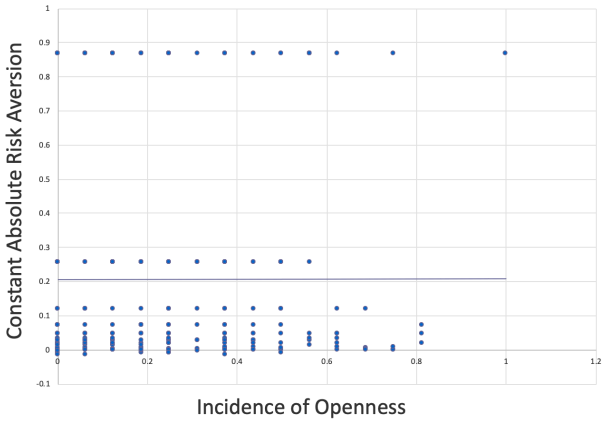
Table 4 – Regression Results

Variables	Estimate	Std.Error	t value	Pr(>|t|)
(Intercept)	0.2632937	0.1347066	1.955	0.05164
Treatment	0.1638236	0.1641679	0.998	0.31919
Openness	0.3377062	0.1463657	2.307	0.02177
Conscientiousness	-0.153159	0.1166046	-1.313	0.1901
Extraversion	-0.0546759	0.0951851	-0.574	0.56615
Agreeableness	-0.1184258	0.1262531	-0.938	0.34906
Neuroticism	0.0613276	0.1103147	0.556	0.5787
Male	-0.1117876	0.0387125	-2.888	0.00419
Age	-0.0006242	0.0018279	-0.341	0.733
Negative	0.0524279	0.0447961	1.17	0.24286
Treatment*Openness	-0.4534238	0.1961221	-2.312	0.02151
Treatment*Conscientiousness	0.1181605	0.1778183	0.665	0.50692
Treatment*Extraversion	0.0575138	0.1333902	0.431	0.66668
Treatment*Agreeableness	0.0285608	0.1802206	0.158	0.8742
Treatment*Neuroticism	-0.1743683	0.1508221	-1.156	0.24863

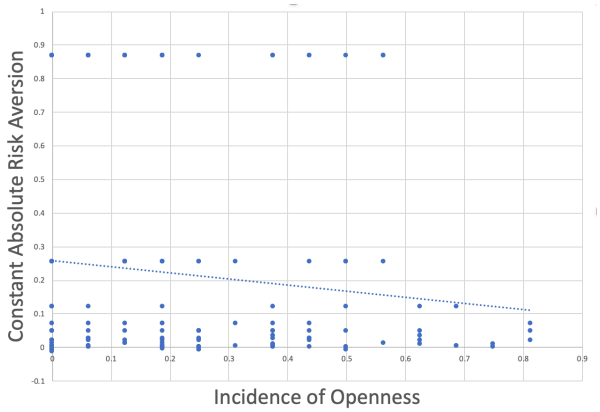
The results confirmed the established link between gender and risk aversion, with males being significantly less risk averse than females. However, the only interaction term that was significant was the interaction between the treatment and Openness. Since this coefficient was significantly negative, that meant that for those who were exposed to the treatment effect, the simulated loss of money, the relationship between risk aversion and Openness was more negative than for those in the Control Group, confirming that particular element of the hypothesis. The findings also suggest that the relationship between each of the other 4 Big Five Inventory Personality Traits and risk aversion was not significantly different between the Treatment Group and the Control Group. Figure 5 shows the relationship of Openness and risk aversion across three scatterplots: one consisting of the entire dataset, one consisting of only respondents in the Treatment Group, and one consisting of respondents in the Control Group.

Figure 5

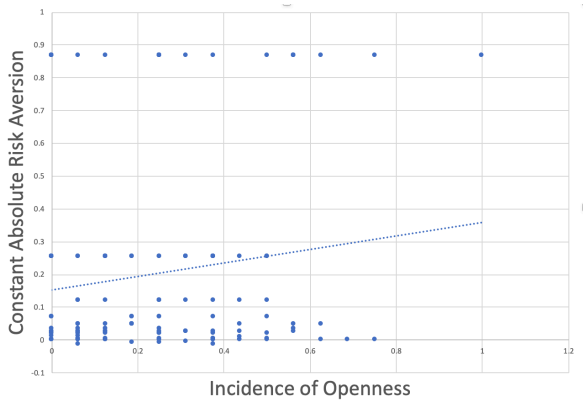
CARA by Incidence of Openness (Entire Dataset)



CARA by Incidence of Openness (Treatment Group Only)



CARA by Incidence of Openness (Control Group Only)



The scatterplots appear to corroborate the finding in the linear regression.

c. Implications and Further Research

The full picture of the relationship between Openness and risk aversion demonstrates the insight made possible by this study. While the relationship between a personality trait and risk aversion, certain events in a person's life can completely manipulate the relationship for them. It demonstrates that certain occurrences in individuals' lives can have lasting effects on their behavior.

There are a few caveats to the findings in this study. While the model presented was the model of best fit, its R^2 was still only 0.075. Also, the approximately 70% of the dataset had Certainty Equivalents of $25.00 or less, demonstrating rather extreme risk aversion. In addition, the average time spent on the survey was only approximately 4 minutes, far less than the 15-minute expected length. This suggests that many of the MTurk respondents may have rushed through the survey, and therefore, not acted the way they normally would have in an actual scenario as the one simulated in this study. Also, the isolated effect of the Treatment was insignificant, suggesting that the $1.50 loss in the lottery did not fully simulate a negative investment return, which, in most cases, are far greater than $1.50.

Further research will be conducted in a lab setting, where respondents will be less likely to rush through the survey. In addition, the stakes of the simulated lottery will be much higher than $1.50 in order to more accurately elicit the psychological reaction that comes from an investment loss. The bonus dependent on respondents' choices in the risk aversion choice task will also be awarded to all respondents, rather than a small pool in order to provide a greater incentive to act in the way they believe, based on their own way of thinking, will make the most

economic sense for them. Allowing respondents to name the certain amount it would take for them to forego the lottery would be another possibility.

V. Conclusion

In conclusion, this research has the potential to shine a light on a previously unexplored relationship. While research showing the relationship of the Big Five Inventory personality traits with risk aversion has been conducted before, none have studied the moderating effect of negative investment returns on these relationships. This will be important in gaining a more accurate picture of the relationship of personality and risk aversion. The results showed a new potential insight of the relationship between Openness and risk aversion being more negative among individuals exposed to negative investment returns than among those who have not. However, the isolated effect of the negative investment return simulated in the experiment was insignificant, suggesting that the loss did not go far enough in simulating an actual investment loss. This is conceivable since many individuals' investment losses are far greater than the $1.50 loss in the experiment. Therefore, in order to reach any deterministic conclusions from this study, further research, with a much more significant simulated investment loss, must be conducted.

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